

Central Intelligence Agency

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## DIRECTORATE OF INTELLIGENCE

12 March 1985

Priorities for Developing China's Computer Industry [REDACTED]

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Summary

During 1984, central government and local authorities in China reorganized their computer resources to focus on microcomputer production and software development. Although the effort is intended to remedy the duplication of resources and lack of coordination that traditionally have plagued the Chinese computer industry, the proliferation of oversight organizations and multiple priorities may be worsening the problem. China is concentrating on acquiring foreign microcomputer production technology as a way of achieving eventual self-reliance in computers, but it continues to purchase some larger computer systems and other production technology from US, Japanese, and other foreign firms. Software development is being heavily emphasized, particularly that related to Chinese language processing, as a key to broadening computer applications in China. [REDACTED]

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Introduction

Although development of computers and electronics has been a priority for China throughout this decade, high-level interest in expanding the number and uses of computers increased

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This memorandum was prepared by [REDACTED] of the Office of East Asian Analysis in response to a request from the Deputy Assistant Secretary for Trade Development, Department of Commerce. Questions and comments are welcome and may be addressed to Chief, China Division, [REDACTED]

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significantly in 1984. At an April conference for coordinating development of computerization in China, Premier Zhao Ziyang said China must make a great effort to catch up with industrialized nations in the computer field. Deng Xiaoping and Party Chairman Hu Yaobang subsequently spoke out on the importance of computer development to China's modernization effort. Premier Zhao's interest reportedly was stimulated in part by Alvin Toffler's book, The Third Wave, and its discussion of the importance of information technology to the post-industrial society. More generally, disappointing results from China's past efforts to develop its computer industry also led Beijing to reexamine its computer development efforts. Overall, Chinese computer production has increased only slowly, has not been able to meet demand, is of varying quality, and lacks standardization.

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According to recent statements by Li Peng, head of the Leading Group for Invigoration of Electronics, China will produce microcomputers as its main computer product, while also giving consideration to medium-sized and large computer models. Greater attention will also be given to the development of the software needed to apply computers to China's economic modernization. Beijing sees Chinese character information processing technology as the key to popularizing and applying foreign technology to China. Although many of these priorities have been previously identified, Beijing apparently is hoping that centrally directed organizational changes and unified oversight will lead to more successful implementation of its plans.

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### Organizing Domestic Computer Resources

In late 1984, a Ministry of Electronics Industry (MEI) official said the Chinese computer industry consisted of 20 developmental institutes, 111 manufacturing facilities, 13 service organizations, and over 90,000 employees. Less than half of these resources are believed to be under MEI control, with the remainder subordinate to municipalities and provinces. Additional electronics resources are subordinate to the several defense-related ministries. Beijing, Guangzhou, and Shanghai are major centers of computer research and production.

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Both MEI and provincial authorities have given renewed attention to the organizations and policies governing computer development. The MEI's China Computer Technical Service Company (CCTSC) has been increasingly active in promoting computer use and securing foreign cooperation in computer research and development. Some provinces have established provincial computer centers or provincial computer leading groups to plan microcomputer production, distribution, and applications. Several locations have combined computer research and production units to facilitate transfer of research results, eliminate duplication of efforts and improve production. (See table for major computer research and production units.)

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Shanghai, which produces roughly one-third of China's computers, has made a particularly visible commitment to the priority development of its computer industry. The municipality has formed a Leading Group for Computers and Large Scale Integrated Circuits and assigned responsibility for the development of electronics industry to two vice mayors. In the spring of 1984 Shanghai created the Shanghai Computer Company to oversee computer research and development, production, service, training and marketing for six of Shanghai's computer enterprises and established a similar organization to coordinate software development. [REDACTED]

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All of these reorganization efforts are intended to promote greater coordination and more efficient use of resources, yet we believe the proliferation of oversight organizations may cause confusion. The relationship of municipal organizations to oversight organizations at the ministerial or national level (e.g., the MEI's Administration of Computer Industry or the Leading Group for the Invigoration of Electronics) is unclear. [REDACTED]

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[REDACTED] Even at the local level, confusion persists. The Shanghai Computer Company, for example, shares control over the Shanghai Computer Technology Research Institute with the Shanghai S&T Commission. Moreover, the creation of oversight and marketing units has done little to dampen the competition between factories for computer production and sales. [REDACTED]

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### Popularizing Computers

Beijing has initiated a series of educational efforts aimed at expanding "computer literacy," including sponsoring exhibits and holding conferences on computer applications in foreign trade, industry, and the military. The State Economic Commission and the Chinese Association for Enterprise Management are running computer training courses for managers and factory directors. China is equipping more schools with computers and introducing computer courses for elementary and middle school children. Scientific associations have joined in popularizing computer knowledge among youths through national computer design contests and science camps, with prominent S&T officials participating in the ceremonies. [REDACTED]

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Provinces are also promoting microcomputer education and applications. Heilingjiang Province, for example, has equipped some primary and middle schools as well as research institutes with computers. Liaoning Province subsidizes units that use or develop microcomputers and offers low-interest loans and tax breaks to units purchasing computer equipment. [REDACTED]

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## Applications

China's goal is to apply computers to a wide range of economic, social, scientific, government, and industrial activities. Microcomputers have been used in the textile, chemical metallurgical and publishing industries, as well as for traffic control, hotel management, medical diagnostics, aeronautics research, and even video introductions for singles at the Beijing Marriage Consulting Center. The military is using microcomputers for training, operations, administration and management, rear services activities, war games training exercises, and weapons control applications.

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Computer networks are being developed for national economic planning, management of S&T information, meteorological uses, energy management and other purposes. The military also appears keenly interested in networking applications. For example, military related organizations have negotiated with Honeywell for joint development of a computer network based on the DPS-6 minicomputer. Despite claims that this network is for office applications, such a network would probably be used for command and control purposes or for China's strategic missile force. Networking applications in China are currently limited by lack of adequate telecommunications lines, incompatible equipment, and lack of equipment, experience and software. Chinese emphasis on fiber optic communications for both long-haul and local digital transmission also indicates the growing significance of computer-to-computer interface. A number of local area networks (LANs) already are being established utilizing fiber optics.

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## Domestic Production

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Estimates of Chinese computer production and of China's computer inventory vary greatly, although it is clear that both have increased significantly in the past two or three years. From production of 250 to 350 computers of all types in 1982, China reportedly produced between 3,700 and 5,400 microcomputers in 1983. Some MEI officials claim China produced more than 20,000 microcomputers in 1984, but we believe this number is inflated because official statistics indicate Shanghai--generally believed to produce one-third of China's computers--produced only about 3,000 micros in 1984. Some Chinese officials put expected microcomputer production for 1985 at 30,000. One Chinese official claimed in 1984 that China had a total inventory of

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30,000 domestic and imported microcomputers, while foreign press estimated the number to be 57,000 microcomputers by the end of 1984. [REDACTED]

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In our view, enthusiasm for developing the computer industry is causing Chinese officials to set unrealistic production goals. A manager of the Shanghai Computer Factory, for example, said microcomputer production at the factory is to increase from several hundred per year in 1984 to 10,000 per year, even though assembly lines were not even partially automated. Shenzhen special economic zone near Hong Kong, slated to become an important electronics base, hopes to produce 100,000 microcomputers per year even though proposals for development are still under evaluation. [REDACTED]

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Many of the Chinese computer models reportedly under production in China may be prototypes. Standardization of production is a major problem, as is obtaining high quality components. Chinese computers frequently are copies of foreign computers or rely on imports of important components such as microprocessors. Western specialists have commented that Chinese-built computers are expensive, and often cost more than imported computers. [REDACTED]

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Microcomputers. Of the many Chinese models said to be under production, the Great Wall 100 and the BCM 3, both 16-bit machines, seem to be slated for mass production. [REDACTED]

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Supercomputers. According to Chinese press, China's Galaxy supercomputer was developed at the National Defense S&T University in Changsha and is capable of 100 million instructions per second (mips). The effective speed of this computer, which we believe is probably devoted to military research, is probably slower and its applications reportedly are limited by lack of software. However, its development reveals Chinese familiarity with advanced computer architectures such as vector and parallel processing. The Chinese Academy of Sciences' Institute of Computer Technology in Beijing developed a dual processing machine--called the 757--which is capable of 10 mips. This machine has been mistakenly identified as a supercomputer by some foreign visitors. Ministry of Petroleum Industry officials also

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have been trying to obtain supercomputers from the US and France,

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### Acquisition of Foreign Equipment and Technology

China has purchased or expressed interest in purchasing many types of computers and related peripheral equipment during the past year. Recently, China has started buying large numbers of micro- and mini-computers at one time, sometimes in a semi-knocked-down state for assembly in China. Most purchases involve hardware and software training.

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Although many Chinese organizations negotiate for foreign computer purchases, apparently without central coordination, the government appears to control most computer purchases through import licenses. Organizations unable to obtain licenses, or lacking foreign exchange, have been forced to purchase equipment from other Chinese organizations, which resell imported computers at vastly inflated prices.

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China's current attitude toward imported microcomputers seems ambivalent. State Department officials reported that import licenses for microcomputers were particularly hard to obtain in late 1984. In January 1985, China raised the import duty on small computers (under 32-bit) to between 50 and 70 percent, which should further discourage microcomputer imports. On the other hand, on 6 March, China's General Administration of Customs announced a reduction of import duties on microchips and data processing equipment from 25 percent to between 6 and 9 percent to aid the electronics industry and spread the use of microcomputers. We suspect, but cannot be certain, that these reductions do not apply to small computers. We continue to believe Beijing is tightening control of microcomputer imports primarily to force foreign firms to transfer production activity to China. Conserving foreign exchange and protecting the domestic industry may be additional concerns. At the same time,

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however, China probably recognizes that imports of some equipment will be necessary to meet the sizable pent-up demand for computers. [REDACTED]

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Chinese acquisition of foreign production technology accelerated during 1984, and China will seek additional joint ventures in the future. [REDACTED]

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The availability of computers in China has increased significantly, and these joint ventures will further increase the numbers of computers in China. These agreements will take some time to reach their full potential, however. A microcomputer production line imported from France in 1979 began production only in 1983. Most of the foreign companies involved are planning long training and supervisory programs to ensure quality. [REDACTED]

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## Software

China sees development of a strong software industry as both necessary to successful application of computers in China and as an area in which China might succeed quickly. The MEI, the State S&T Commission, and the Ministry of Education have each established new organizations to oversee software development, as has Shanghai. These organizations are seeking foreign cooperation in developing China's software industry. Several also are planning software exports. [REDACTED]

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The MEI established the China Software Technical Company (CSTC) in April 1984 to direct, coordinate, and evaluate the national effort to establish a modern software industry. The objectives of the company are to reduce the duplication of effort in Chinese software research and to draw up a five-year plan to develop the software industry. The company is to have a staff of 120 professionals, with the budget reportedly more than US \$50 million over the next five years. CSTC already has begun publishing a trade magazine, established a model software factory, and set up the China Computer Software Association for sharing and distributing software throughout China. CSTC officials have said they will hire foreign firms to assist in developing China's software industry, but these firms will eventually withdraw as China becomes self-sufficient. [REDACTED]

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MEI's China Computer Technical Service Company (CCTSC) also devotes a major part of its efforts to the development of China's software industry and popularizing computer usage. CCTSC cooperated with four foreign firms in setting up software research centers in China. CCTSC researchers have also developed under contract an anti-earthquake software program for Japan, and in 1983 CCTSC signed a long-term contract with Nippon Electric Company (NEC) to produce software. [REDACTED]

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The Ministry of Education consolidated its software research, development, and training units into an inter-university software research center in March 1984. The center will offer technical services to the government, military and industrial enterprises, make plans for software development, train software personnel and formulate standards for software research personnel. [REDACTED]

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In addition, the State S&T Commission and other central government organs in mid-1984 planned the establishment of two "world class" software development centers in Beijing and Shanghai. The Beijing Center reportedly will specialize in software for microcomputers while the Shanghai center will work

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on software for larger systems, possibly with military applications. Each of the centers, estimated to cost \$30 million for design and construction, is intended to accommodate 1,000 programmers drawn from universities. [REDACTED]

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Officials in Shanghai reorganized their software research and development units into the Shanghai Software Technology Development Center, which is responsible for software R&D, production and management of software personnel and resources. The Municipality also set up the Shanghai Software Technical Company in April 1984. According to reporting, the new company, which has an operating budget of \$60 million, is supposed to build a model factory and will eventually have over 600 employees. Shanghai routinely publicizes new software developments, and BASIC is taught twice a day on television. [REDACTED]

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Shanghai's Jiaotong University established the Nanyang International Technology Company as an auxilliary profit center in 1983 to produce software for export. Nanyang has a contract with a US firm to develop software for the US market and is negotiating with several Japanese firms. Nanyang engineers reportedly have developed domestic software packages for shipbuilding, industrial process control, and computer-aided design applications, although to date their work for the US firm has been limited to software program conversions, spreadsheet applications and game packages. [REDACTED]

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A major focus of Chinese software research is on Chinese character processing systems, which are essential if computers are ever to be widely used in China. At an October 1983 international conference on Chinese Information Processing in Beijing, Chinese specialists said over 200 methods for coding Chinese characters had been proposed by Chinese researchers, and over 20 were currently under development at various research centers. An exhibition of Chinese character processing methods that same month revealed a handful of systems developed by Chinese researchers, most of which relied at least partially on imported components. A system developed by the China Information Research Institute reportedly is being used by a Hong Kong company to produce a Chinese-English computer. [REDACTED]

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Chinese software specialists claim a wide variety of software and operating systems are available in China. At the same time, Chinese software experts are trying to acquire software from Western and Japanese firms. [REDACTED]

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The Chinese expect the software industry to progress more rapidly than the hardware industry in part because software relies more on personnel and intellectual power than equipment. The biggest obstacle to fulfilling China's software development goals, however, is still a shortage of qualified software specialists. [REDACTED]

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[REDACTED] Beijing's expectations for training large numbers of software specialists quickly are probably optimistic. A Vice Minister of Education in March 1984 claimed China had 10,000 software specialists and said China would have over 100,000 specialists by 1990. Some Western observers believe China currently has a surplus of computer power because it lacks the personnel and the know-how to use effectively the computers already on hand. [REDACTED]

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Other problems also exist. The head of the Shanghai Software Technology Development Center told Western visitors the development effort suffers from a shortage of systems engineers and the lack of software tools such as high-level editors and microprocessor development systems. China would like to import computer hardware that will allow it to tailor software packages to specific operating systems, but it continues to run into problems in obtaining US export licenses. [REDACTED]

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Table: Major Computer Organizations

<u>Organization/Facility</u>	<u>Products/Activities</u>
NATIONAL ORGANIZATIONS:	
Bureau of Computer Industry, (BCI) MEI	Major responsibility for development of computer industry in China; has three research institutes, 1 college, 16 factories subordinate to it.
China Computer Technical Service Company, (CCTSC), MEI (Est. 1980)	Promotes application of computers, sells and distributes computers and software; computer training; after-sales maintenance and repair service; training; branches throughout China. Has entered joint ventures with US company for cooperative computer technology center in Beijing to promote coproduction of computer technology. Has received technical training from NEC, Japan; set up 4 software centers with foreign firms.
CCTSC sponsored centers:	
Sino-Japan Center	Training Chinese software engineers; popularizing computer usage with enterprise managers.
Sperry-CCTS Computer Center	Training
Data Entry Service Center (with Robin Information Systems, Hong Kong)	Develop computer support for foreign trade
Jingmin Data Entry Center (with RIS Corporation, Singapore)	
Institute of Computer Technology, Chinese Academy of Sciences, Beijing	Primary research institute, developed 757 computer. May split into hardware and software divisions.
China Software Technology (Development) Company (Est. April 1984 by BCI)	Direct, coordinate and evaluate national effort to establish software industry.
China Computer Software Association (Sponsored by China Software Technology Company)	Mechanism for sharing and distributing software packages throughout China.

Chinese Association for Software Industry

National organization to promote exchanges and cooperation between individuals and units engaged in software development.

#### RESEARCH ORGANIZATIONS

East China Institute of Computer Technology, Shanghai (BCI)

Peripherals

No. 15 Research Institute (BCI)

Computer and software development

No. 6 Research Institute (BCI)

Peripherals

China Computer Information Processing Institute, Beijing University (BCI)

First college established solely for software training and development.

North China Institute of Computer Technology, Beijing

PLA largest customer, focusing now on minis and micros, peripherals, networking, Chinese language processing.

Beijing Research Institute of Electronic Applications

With Beijing Wire Factory developed Great Wall-100 microcomputer

Beijing Institute of Software Research and Training, Beijing Engineering University (est. with UN and Norwegian assistance)

Software R&D, training

Beijing Center for International Economic Research

Established under UNDP sponsorship in 1979 to improve information processing in China. Personnel training, development of computer applications.

National Defense University for S&T, Changsha

Computer research for the military. Developed Galaxy supercomputer.

University, Beijing Institute of Computing technology, and Ministry of Foreign Economic Relations and Trade

Nuclear Power Software Center, Beijing (at Institute of Atomic Energy)

Controls software for safety research of nuclear power systems

Northwest Institute of Telecommunications Computer Center, Xian

Techniques for converting computer programs to Chinese

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Shanghai Software Technological Development Center  
Comprised of:

Shanghai Computer Technology Research Institute

Computer Technology Service Company

Jiaotong University

Shanghai Industrial University

The S&T University of Shanghai

Shanghai Normal University

Shanghai Parttime University

The Shanghai Investment and Trust Corporation

Fudan University

Contract from US firm to convert software from mainframe to minicomputer use; work on Chinese language processing

Technology Information Institute

Shanghai Computer Applications Service Bureau

Nanyang International Technology Company

Developing software for US company; auxiliary profit center of Jiaotong University; has contract with US firm to develop software for export.

Software Technical Development Center, Guangzhou

#### PRODUCTION FACILITIES

##### Beijing

Beijing Wire Equipment Factory

Great Wall-100 microcomputers (design capacity of 2,000 reached in 1983); previously reported to produce DJS-045 micros using memories imported from the US and Japan, and some minis.

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Beijing No. 3 Computer Factory

16-bit microcomputers, some DJS-1142 minis; uses imported parts.

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Beijing No. 5 Computer Factory	8-bit microcomputers
Beijing Polytechnic University's Electronic Factory	Single-board microcomputers (TP-801)

Shanghai

Shanghai Computer Company  
(Est: March 1984)  
Oversees:

Shanghai Computer Factory (formerly Radio Factory #13)	CPUs, Mainframe, Mini, Micros a leading computer production factory.
Changjiang Computer Factory	CUPs, Micros, computer games.
Shanghai Telecommunications Factory	Telephone Switching systems, telephone units, CRT displays.
Huangpu Instrument Factory	Computers for process control equipment, shipboard computers, hard disk equipment.
Computer Technology Service Company	Marketing, training, development of software applications
Shanghai Computer Technology Research Institute	Computer hardware, software
Shanghai Institute of Computer Technology	9 laboratories, 1 pilot plant, a number of subordinate manufacturing plants; technological exchanges with US firm and with NEC.

Guangdong

New China Computer Development and Trading Company	Joint venture between Haikou Electronics Industrial Company and New Zealand firm to develop and produce 8 and 16-bit micros, disks, Chinese character terminals, peripherals.
Huanan Computer Corporation	S16 minis under license from French firm Sems.

Nanjing

Zijin Information Industry Corp.  
(comprised of:  
Nanjing Teleprinter Development  
Nanjing Telecommunications Works  
Jiangsu Radio Communications  
Factory  
Nanjing Qianxian Radio Factory)

Design, manufacture, sales of teleprinters, microcomputers, display terminals, telecommunications center; equipment, computer software; produces Venus-II microcomputers using imported CPUs.

## Others

North China Terminal Equipment  
Corporation, Baoding, Hebei

importing 16-bit microcomputer  
production line from NEC

Yunnan Electronics Equipment  
Plant

To produce 1,500 microcomputers in  
1985 using imported US production and  
assembly line.

Fuzhou Computer Factory

Produces DJS-040 and DJS-043 micros  
using US PCBs; wants to import US  
production line for 8-bit micros.

Xian Lian Tchnology Development  
Corporation, Changsha, Hunan

Computer hardware and software research  
and production; has approached US firm  
regarding joint software development.

## Associated with:

Hunan Province Computer Corp.  
Changsha Electronic Industries  
Corporation  
Hunan Computer Research Institute  
Hunan Computer Center

Shanyang Computer Factory

DJS-142 minicomputers

Hangzhou Magnetic Recording  
Equipment Research and  
Development Center

Production of 8-inch 40 megabyte  
Winchester disk drive systems expected  
to begin in 1985 under US license.

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